

FCC Test Report

Product Name	10.7MHz Communication Unit
Model No.	EFC-SPLC-02M
FCC ID.	2AM4X-EFC-SPLC-02M

Applicant	Panasonic Corporation
Address	1006 Kadoma, Kadoma City, Osaka 571-8506, Japan

Date of Receipt	July 24, 2017
Issued Date	Aug. 02, 2017
Report No.	1770340R-RFUSP20V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Aug. 02, 2017

Report No.: 1770340R-RFUSP20V00



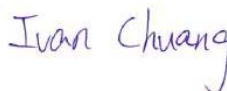
Product Name	10.7MHz Communication Unit
Applicant	Panasonic Corporation
Address	1006 Kadoma, Kadoma City, Osaka 571-8506, Japan
Manufacturer	Panasonic Corporation
Model No.	EFC-SPLC-02M
FCC ID.	2AM4X-EFC-SPLC-02M
EUT Rated Voltage	DC 5V (Power by USB)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	Panasonic
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Genie Chang)

Tested By :



(Senior Engineer / Ivan Chuang)

Approved By :



(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	10.7MHz Communication Unit
Trade Name	Panasonic
Model No.	EFC-SPLC-02M
FCC ID.	2AM4X-EFC-SPLC-02M
Frequency Range	10.7MHz
Type of Modulation	ASK
Type of antenna	Case-attached metal flat type
Number of Channel	1

Frequency of Each Channel:

Channel	Frequency
1	10.7MHz

Note:

1. The EUT is a 10.7MHz Communication Unit with a built-in 10.7MHz transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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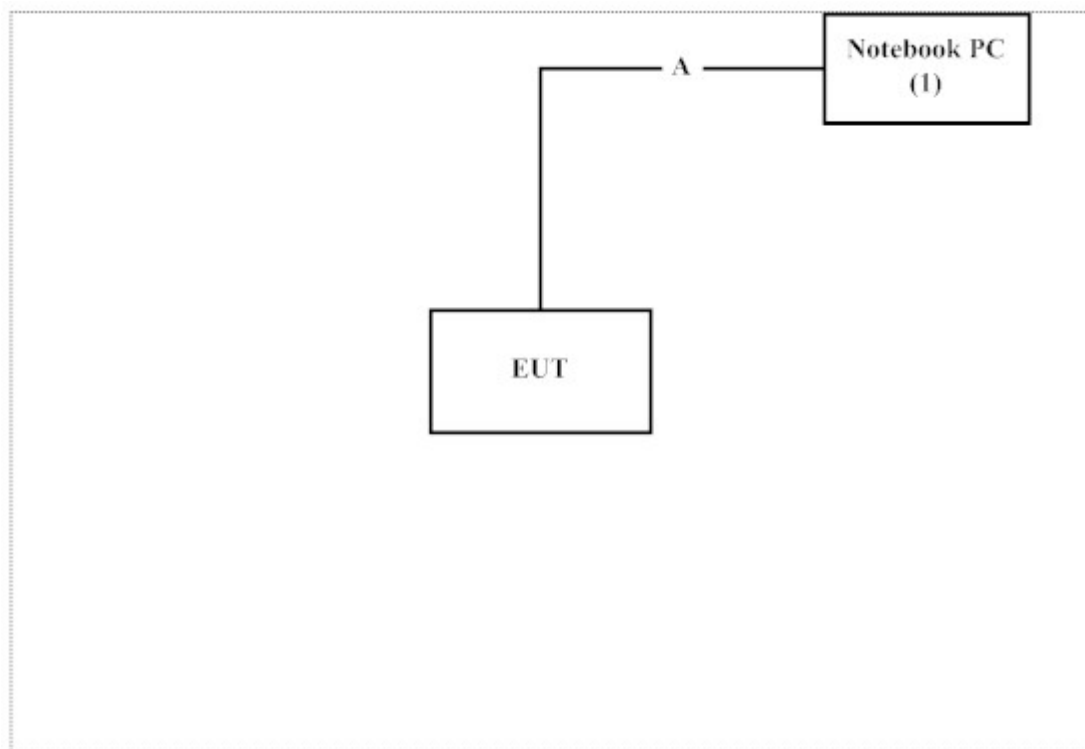
1.3. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
(1)	Notebook PC	DELL	P62G	416FJC2	Non-Shielded, 1.8m

Signal Cable Type		Signal cable Description
A	USB Cable	Non-Shielded, 0.3m

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Provide power supply and press the button of EUT.
- (3) Start the continuous transmitter.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
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FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	161601	2017.01.06	2018.01.05
X	Two-Line V-Network	R&S	ENV216	101306	2017.02.16	2018.02.15
X	Two-Line V-Network	R&S	ENV216	101307	2017.03.17	2018.03.16
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

For Radiated measurements /ACB1

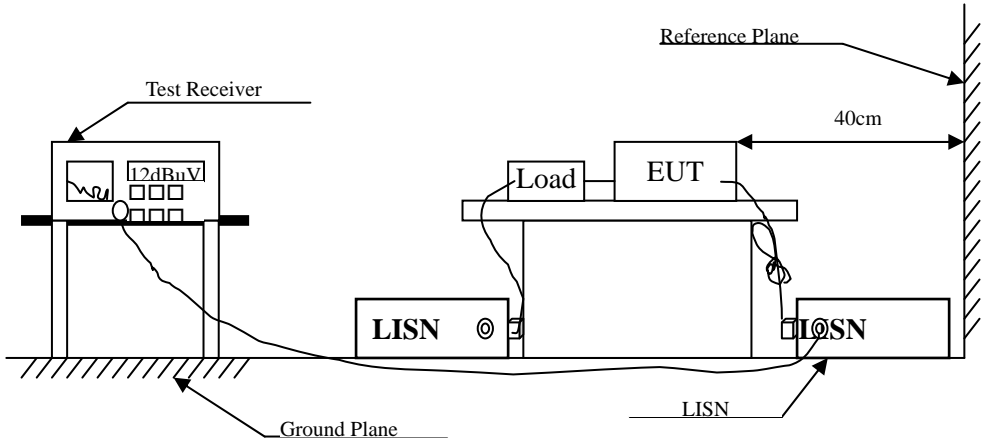
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	TESEQ	HLA6121	37133	2016.03.18	2018.03.17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2017.02.09	2018.02.08
	Horn Antenna	ETS-Lindgren	3117	00203800	2016.10.13	2017.10.12
	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.14	2018.05.13
	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.15	2018.05.14
	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.15	2018.05.14
	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
	Filter	MICRO TRONICS	BRM50702	G251	2016.08.11	2017.08.10
	Filter	MICRO TRONICS	BRM50716	G188	2016.08.11	2017.08.10
X	EMI Test Receiver	R&S	ESR7	101602	2016.12.15	2017.12.14
X	Spectrum Analyzer	R&S	FSV40	101148	2017.01.24	2018.01.23
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2016.08.11	2017.08.10

Note:

1. Loop Antenna is calibrated every two year, the other equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 _(註)	56-46 _(註)
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty


± 2.35 dB

2.5. Test Result of Conducted Emission

Product : 10.7MHz Communication Unit
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test date : 2017/08/01
 Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.152	9.707	32.518	42.226	-23.717	65.943
0.193	9.696	39.885	49.582	-15.189	64.771
1.759	9.786	23.879	33.665	-22.335	56.000
3.500	9.843	23.065	32.908	-23.092	56.000
10.327	9.998	25.979	35.977	-24.023	60.000
22.166	10.135	16.004	26.139	-33.861	60.000
Average					
0.152	9.707	14.594	24.301	-31.642	55.943
0.193	9.696	28.654	38.350	-16.421	54.771
1.759	9.786	13.244	23.030	-22.970	46.000
3.500	9.843	13.635	23.478	-22.522	46.000
10.327	9.998	20.212	30.210	-19.790	50.000
22.166	10.135	8.425	18.560	-31.440	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 10.7MHz Communication Unit
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test date : 2017/08/01
 Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.152	9.698	38.651	48.349	-17.594	65.943
0.242	9.692	31.336	41.028	-22.343	63.371
0.699	9.744	22.951	32.695	-23.305	56.000
2.841	9.826	18.042	27.868	-28.132	56.000
10.100	9.989	26.487	36.476	-23.524	60.000
21.595	10.177	16.776	26.953	-33.047	60.000
Average					
0.152	9.698	20.092	29.790	-26.153	55.943
0.242	9.692	14.159	23.851	-29.520	53.371
0.699	9.744	11.164	20.908	-25.092	46.000
2.841	9.826	9.573	19.398	-26.602	46.000
10.100	9.989	20.900	30.889	-19.111	50.000
21.595	10.177	9.533	19.710	-30.290	50.000

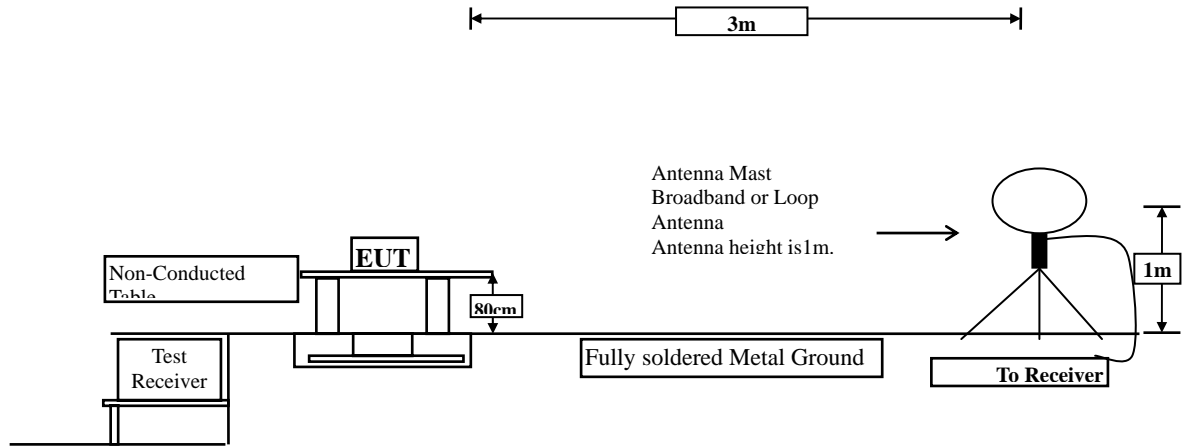
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

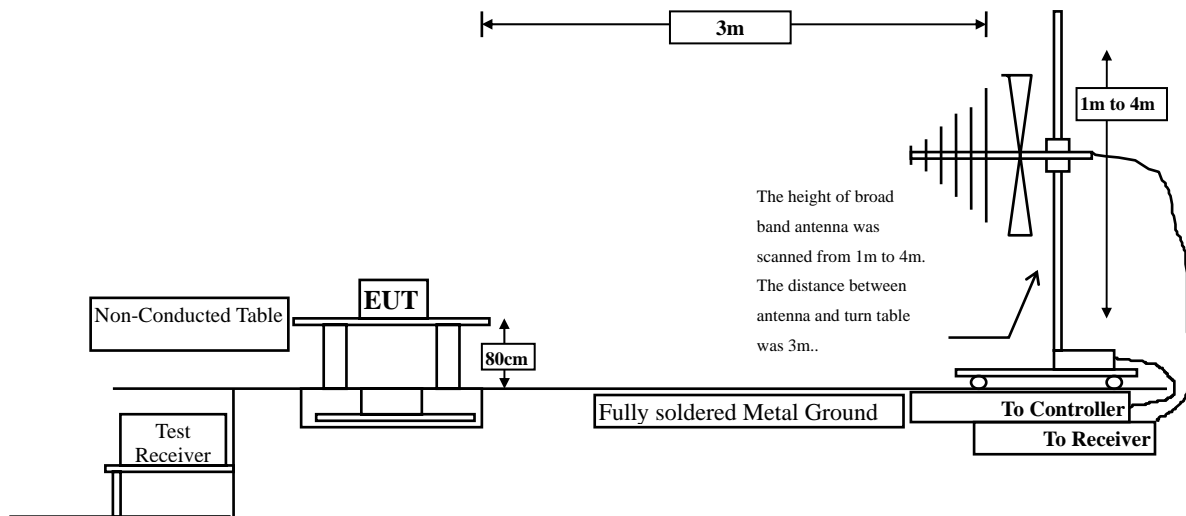
3. Radiated Emission

3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



3.2. Limits

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks :
1. RF Voltage (dBuV) = $20 \log$ RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.209 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz. Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

Horizontal :

30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$ °

Vertical :

30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$ °

3.5. Test Result of Radiated Emission

Product : 10.7MHz Communication Unit
 Test Item : Radiated Emission
 Test date : 2017/08/01
 Test Mode : Mode 1: Transmit

Fundamental

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Quasi-Peak					
X-axis					
Horizontal					
10.700	15.491	13.900	29.391	-40.149	69.540
Vertical					
10.700	15.491	17.100	32.591	-36.949	69.540
Y-axis					
Horizontal					
10.700	15.491	11.200	26.691	-42.849	69.540
Vertical					
10.700	15.491	17.700	33.191	-36.349	69.540
Z-axis					
Horizontal					
10.700	15.491	14.700	30.191	-39.349	69.540
Vertical					
10.700	15.491	20.000	35.491	-34.049	69.540

Note:


1. The reading levels below 1GHz are quasi-peak values.
2. Measurement Level = Reading Level + Correct Factor.

Product : 10.7MHz Communication Unit
 Test Item : Radiated Emission
 Test date : 2017/08/01
 Test Mode : Mode 1: Transmit

9kHz~30MHz

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Quasi-Peak					
Horizontal					
21.400	4.120	10.700	14.820	-54.720	69.540
Vertical					
21.400	4.120	10.600	14.720	-54.820	69.540

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 10.7MHz Communication Unit
 Test Item : General Radiated Emission
 Test date : 2017/07/29
 Test Mode : Mode 1: Transmit

30MHz~1GHz

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Quasi-Peak					
Horizontal					
90.449	-17.245	43.728	26.483	-17.017	43.500
239.464	-12.070	35.664	23.594	-22.406	46.000
448.928	-6.441	26.943	20.502	-25.498	46.000
633.087	-3.067	30.119	27.052	-18.948	46.000
775.072	-0.949	32.845	31.896	-14.104	46.000
946.580	1.042	30.770	31.812	-14.188	46.000
Vertical					
159.333	-10.589	35.808	25.219	-18.281	43.500
294.290	-10.202	33.844	23.642	-22.358	46.000
486.884	-5.774	31.079	25.305	-20.695	46.000
628.870	-3.104	28.823	25.719	-20.281	46.000
776.478	-0.933	32.006	31.073	-14.927	46.000
935.333	0.920	31.733	32.653	-13.347	46.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs